

Robotic Asteroid Prospector (RAP) Staged from L-1: Start of the Deep Space Economy

Completed Technology Project (2012 - 2013)



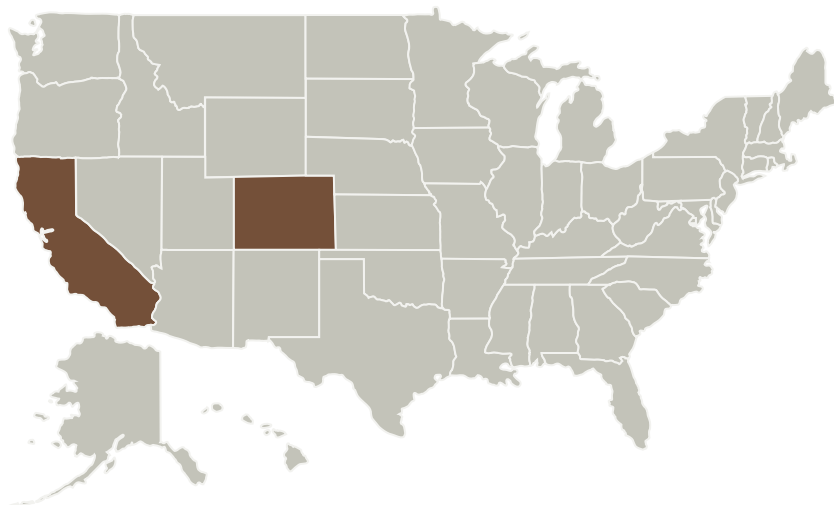
Project Introduction

Robotic Asteroid Prospector (RAP) project will examine and evaluate the feasibility of asteroid mining in terms of means, methods, and systems. The objectives of the Robotic Asteroid Prospector (RAP) project are to examine and evaluate the feasibility of asteroid mining in terms of means, methods, and systems. This study decomposes the challenge of asteroid mining into four key efforts: Mission design, including trajectory and logistics from an Earth-Moon Lagrange Point (EMLP) to the asteroid and return to that EMLP, Spacecraft design including propulsion and Mission operations, Mining technology for microgravity and vacuum operations, and How these efforts can add up to a business case for asteroid mining.

Anticipated Benefits

The economic premise of RAP is that humans will develop an infrastructure for living and working in space. In this century, this infrastructure will grow to support hundreds of people and eventually thousands of people across the Solar System.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Astrostructure	Lead Organization	Industry	
Honeybee Robotics, Ltd.	Supporting Organization	Industry	Pasadena, California
New Space Analytics LLC	Supporting Organization	Industry	
V Infinity Research, LLC	Supporting Organization	Industry Women-Owned Small Business (WOSB)	

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Astrostructure

Responsible Program:

NASA Innovative Advanced Concepts

Project Management

Program Director:

Jason E Derleth

Program Manager:

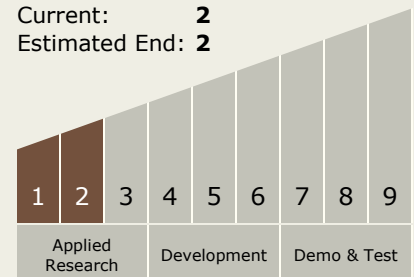
Eric A Eberly

Principal Investigator:

Marc Cohen

Technology Maturity (TRL)

Start: **1**
 Current: **2**
 Estimated End: **2**



Project Transitions

September 2012: Project Start

September 2013: Closed out

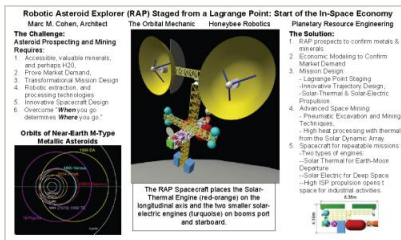
Closeout Summary: Our final report presents the results from the nine-month, Phase 1 investigation for the Robotic Asteroid Prospector (RAP). This project investigated several aspects of developing an asteroid mining mission. It conceived a Space Infrastructure Framework that would create a demand for in space-produced resources. The resources identified as potentially feasible in the near-term were water and platinum group metals. The project's mission design stages spacecraft from an Earth Moon Lagrange (EML) point and returns them to an EML. The spacecraft's distinguishing design feature is its solar thermal propulsion system (STP) that can provide for three functions: propulsive thrust, process heat for mining and mineral processing, and electricity. The preferred propellant is water since this would allow the spacecraft to refuel at an asteroid for its return voyage to Cis-Lunar space thus reducing the mass that must be staged out of the EML point. The spacecraft will rendezvous with an asteroid at its pole, match rotation rate, and attach to begin mining operations. The team conducted an experiment in extracting and distilling water from frozen regolith simulant.

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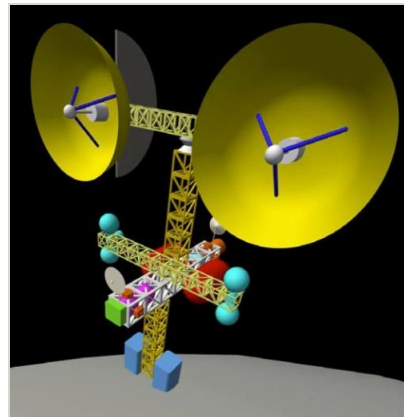


Images



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Project Image Robotic Asteroid Prospector (RAP) Staged from L-1: Start of the Deep Space Economy (<https://techport.nasa.gov/image/102301>)



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Project Image Robotic Asteroid Prospector (RAP) Staged from L-1: Start of the Deep Space Economy (<https://techport.nasa.gov/image/102156>)

Technology Areas

Primary:

- TX07 Exploration Destination Systems
 - └ TX07.1 In-Situ Resource Utilization
 - └ TX07.1.2 Resource Acquisition, Isolation, and Preparation

Target Destination

Others Inside the Solar System